

Tumbling Creek Cave Ecosystem

Conservation Opportunity Area



Ozark
Highlands



Tumbling Creek Cave has the highest recorded biological diversity of any cave west of the Mississippi River.

Ozark Underground Laboratory

Located in southeast Taney County and southwest Ozark County, the Tumbling Creek Cave Ecosystem features open oak woodlands with scattered rocky glades. Existing glade and woodland complexes provide habitat for a variety of wildlife, including species of conservation concern such as Bachman's sparrows, painted buntings and eastern collared lizards. The Tumbling Creek Cave Ecosystem's rarest species, however, live underground.

Tumbling Creek Cave is home to at least 110 animals, including several known only from this cave. The cave stream contains the planet's only known population of the federally endangered Tumbling Creek cavesnail. In addition to its selection as a National

Natural Landmark, Tumbling Creek Cave has been designated a Priority 1 gray bat cave ("absolutely essential" in preventing extinction).

The Tumbling Creek Cave Ecosystem Conservation Opportunity Area (COA) includes land surrounding the nine square mile recharge area for Tumbling Creek Cave and the Big Creek Arm of Bull Shoals Lake. Woodlands and forests along the Big Creek Arm provide important foraging areas for a maternal gray bat colony that utilizes the cave. Since approximately two-thirds of the Tumbling Creek Cave Ecosystem is privately owned, encouraging compatible private land management will be a critical component of conservation success.

Tumbling Creek Cave Ecosystem Conservation Strategies

- Increase glade connectivity and plant diversity.
- Restore woodland natural communities.
- Control invasive plants and animals.
- Reduce pollutants entering groundwater through erosion control, protection of karst features and improved sewage treatment.
- Protect habitats within Tumbling Creek Cave.
- Encourage compatible private land management through improved delivery of cost-share and incentive programs.
- Expand environmental education programs.



Ozark Underground Laboratory

Woodlands and forests surrounding Big Creek provide important foraging habitat for gray bats.

Priority Research and Inventory Needs

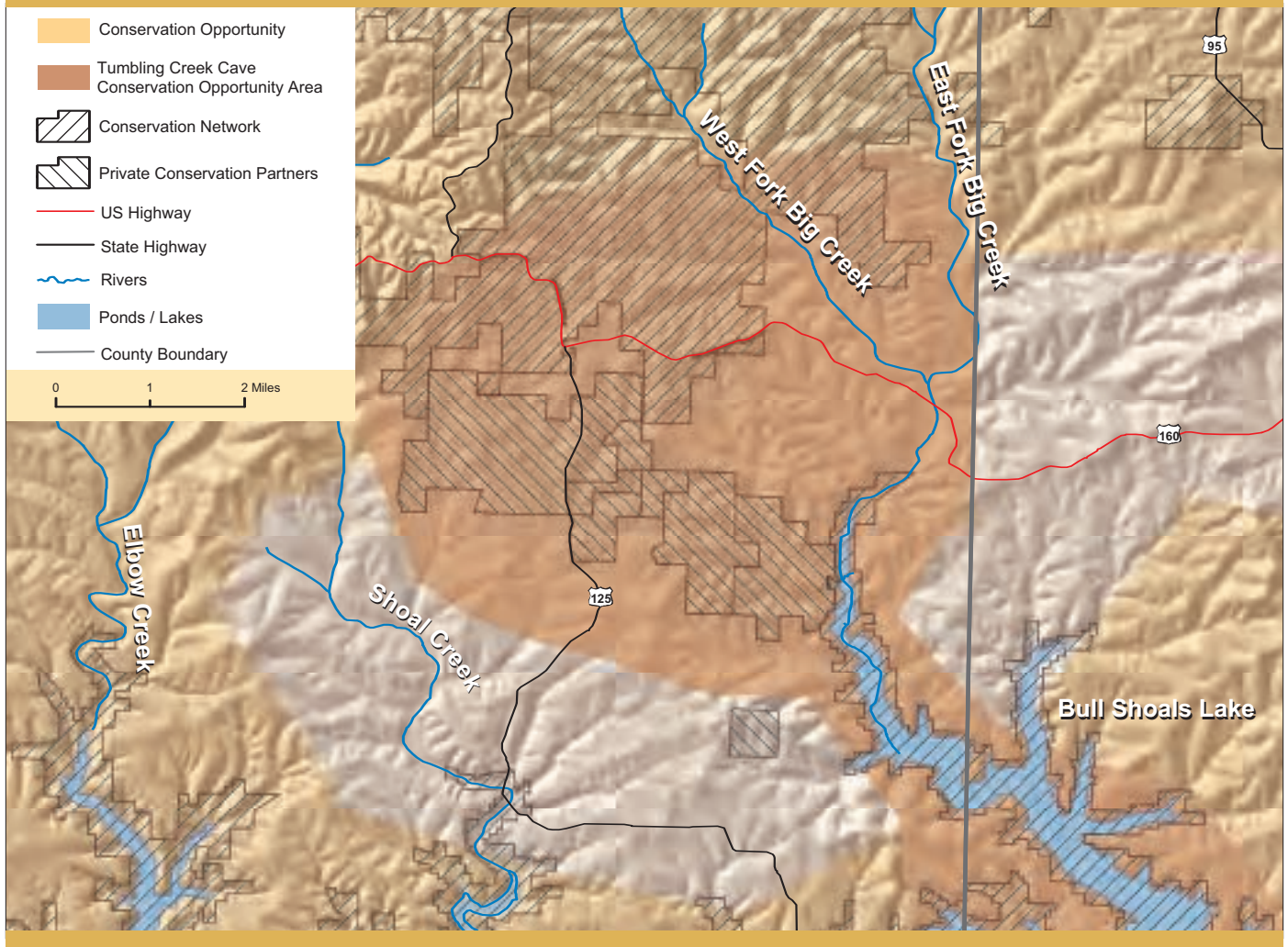
- Determine the best methods for reforesting stream and river banks.
- Investigate the impacts of Bull Shoals Reservoir flooding on cave habitats.
- Determine techniques for artificially propagating Tumbling Creek cavesnails.
- Continue monitoring bat populations at Tumbling Creek Cave.
- Survey for additional bat caves in the Tumbling Creek Cave Ecosystem COA.
- Survey for additional caves with habitat suitable for the Tumbling Creek cavesnail.
- Develop Ecological Landtype data for the Tumbling Creek Cave Ecosystem COA.
- Inventory and characterize karst features (including losing streams and sinkholes).

Conservation Partners

Existing: Ozark Underground Laboratory (OUL); Tumbling Creek Cave Foundation; American Cave Conservation Association; Cave Research Foundation; Missouri Conservation Heritage Foundation (MCHF); Tennessee Aquarium Research Institute; Mark Twain School; The Nature Conservancy (TNC); private landowners; Southwest Missouri Resource Conservation and Development; U.S. Fish and Wildlife Service (USFWS); U.S. Forest Service (USFS); U.S. Army Corps of Engineers (USACE); Missouri Department of Conservation (MDC)

Potential: Bat Conservation International; Trust for Public Land; Greater Ozarks Audubon Society; Upper White River Basin Foundation; private landowners; USFS (Bonanza Cave); Natural Resources Conservation Service (NRCS)

Tumbling Creek Cave Ecosystem Conservation Opportunity Area



Funding Sources

Existing: OUL annual budget; USFS annual budget; USACE annual budget; USFWS Partners for Fish and Wildlife Program; NRCS Wildlife Habitat Incentive Program; NRCS Grassland Reserve Program; NRCS Environmental Quality Incentives Program; NRCS Farm and Ranch Land Protection Program; Farm Service Agency Conservation Reserve Program; MDC Private Lands Cost Share Program; MDC Wildlife Diversity Funds; Taney County Soil and Water Conservation District State Cost Share Funds; MCHF Stream Stewardship Trust Fund; TNC Grant

Promising Future Sources: National Fish and Wildlife Foundation grants; MDC Landowner Incentive Program; MDC State Wildlife Grants; USFWS Private Stewardship Program; Upper White River Basin Foundation

Existing Conservation Network

Ozark Underground Laboratory; Mark Twain National Forest (Ava District); Bull Shoals Lake



David C. Ashley, Missouri Western State College

Tumbling Creek cavesnails are found only in Tumbling Creek Cave. The population was once estimated at 15,000. Today, as few as 20-40 remain. Water pollution and increased sedimentation are believed to be the primary threats to this tiny aquatic snail.

Ozark Underground Laboratory



The Tumbling Creek Cave Ecosystem is also home to the Ozark Underground Laboratory (OUL). OUL provides hydrologic consulting services to support educational programs and ecosystem protection efforts. The Tumbling Creek Cave Foundation now owns the cave's natural entrance as well as land overlying some of the cave's major passages.

Ozark Underground Laboratory

Conservation Challenges

The Tumbling Creek Cave Ecosystem offers a diverse complex of woodlands, glades and underground cave communities. Potential challenges to conservation success include existing

pollution sources, excessive ATV and dirt bike use, water level management for Bull Shoals Lake, public opinion, economics, differing agency management regulations and limited staff.

To learn more about the Tumbling Creek Cave Ecosystem Conservation Opportunity Area, please contact:

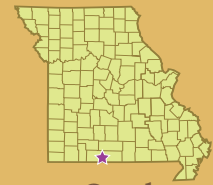


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Tumbling Creek Cave Ecosystem

Conservation Opportunity Area

Groundwater Protection Initiative



Ozark
Highlands



Grotto Salamander



Causeyella Cave Millipede



Ozark Cave Amphipod

William R. Elliott, Missouri Department of Conservation

The term karst refers to a landscape pocketed with sinkholes, caves, springs and losing streams. Over time, water moving through the soil becomes slightly acidic and upon contact, dissolves minute quantities of limestone and dolomite bedrock. When repeated over eons, this process results in underground streams, caves and springs.

Isolation and time frequently result in groups of cave species unique to a region and in some cases, unique to an individual cave. Tumbling Creek Cave in Taney County, Missouri is a good example. In addition to being the only known location of the Tumbling Creek cavesnail, it is home to at least five other animals new to science.

Caves and karst systems are among the most threatened ecosystems in the United States. They are sensitive to land management that causes increased amounts of sediments and pollution to enter caves. In karst regions, sinkholes and losing streams carry sediment and pollution directly underground, degrading and destroying cave habitats while reducing groundwater quality. Protecting or establishing vegetated buffers along karst features (including losing streams and sinkholes) is important for karst conservation. Additionally, providing adequate on-site sewage treatment prevents groundwater pollution.

Sinkhole A surface depression where water is funneled underground.

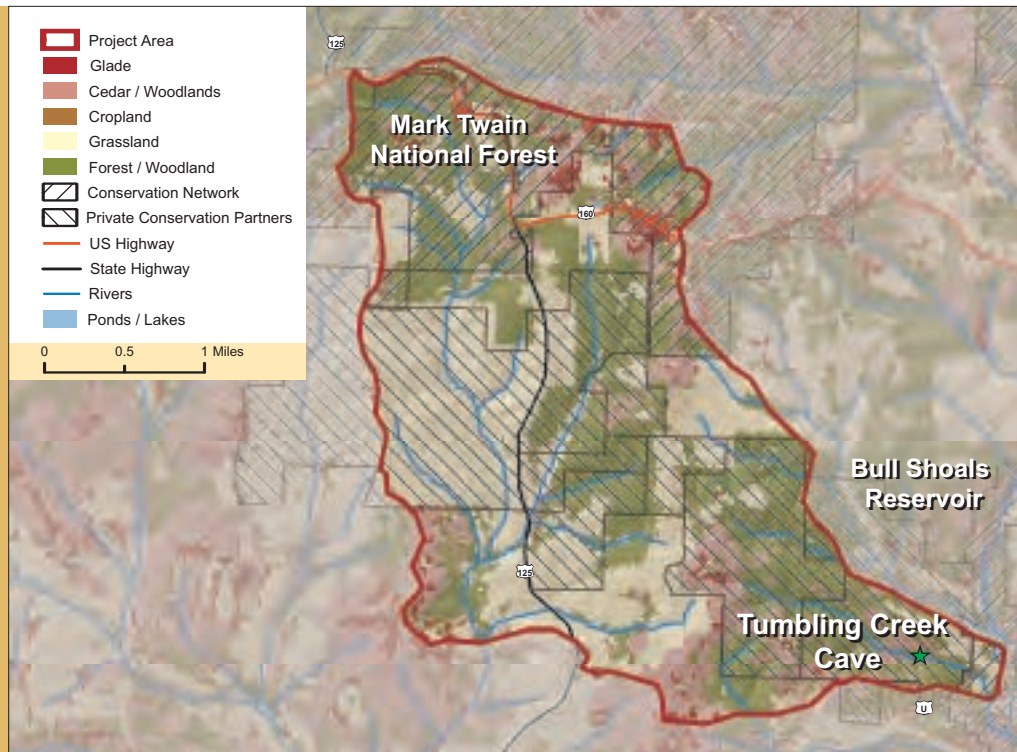
Losing Stream A stream that loses some or all of its surface flow to the underground.

Recharge Area The land area that contributes water to a cave or spring.

Landscape	Community	Species
Tumbling Creek Cave recharge area	Caves, sinkholes, losing streams	Ozark Cave Amphipod, Causeyella Cave Millipede, Tumbling Creek Cavesnail, Grotto Salamander

Strategic Conservation Goal:

Reduce sedimentation and pollution in the Tumbling Creek groundwater system by implementing erosion control efforts, protecting karst features and improving sewage treatment methods.



Desired Change	Proposed Monitoring
↑ Improved buffers around sinkholes and losing streams	Periodic assessment of land cover using satellite imagery or aerial photography; site inspections
↑ Improved sewage treatment	Site evaluations of individual septic systems
↑ Improved vegetation cover using planned grazing, wildlife-friendly grassland management, controlling gully erosion and natural community restoration	Periodic assessment of land cover using satellite imagery or aerial photography; site inspections

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David C. Ashley, Missouri Western State College

To learn more about the Tumbling Creek Cave Ecosystem Groundwater Protection Initiative, please contact:



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